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YELLOW-LEGS SKELETONS.

BY JOHN TREADWELL NICHOLS.

THE writer has been interested in comparing the skeletons of the two Yellow-legs, *Totanus melanoleucus* and *Totanus flavipes*, the skeleton of an adult male of each species taken at Mastic, Long Island, August 23, 1919, being used for that purpose.

The sternum of the former, the Greater Yellow-legs, enlarged three times, is almost exactly of the same length as that of the latter, the Lesser Yellow-legs, enlarged four times; so that by multiplying dimensions of the two by 3 and 4 respectively, it is possible to eliminate size difference and obtain proportional differences. The flaring sides of the sternum, and the shape of its vertical keel, are appreciably different in the two, the keel in the Lesser Yellow-legs shorter and deeper. The skull proper of the Greater Yellow-legs is smaller, but its bill longer, more particularly the solid tip of the bill, the upper mandible much more rigid. The leg of the Lesser Yellow-legs, on the other hand, is the longer, such greater length involving each of the three leg joints, very conspicuous in the middle one. To make a digression at this point, we may say that the skeleton of an adult male Stilt Sandpiper (*Micropalama himantopus*) was also at hand, and comparison with this unrelated bird was at times of interest. In its long legs it is the terminal or tarsal joint which is lengthened, the proportions of the joints being quite different from those of *Totanus*.

Leg comparison.

	femural 27 mm.	tibial 67 mm.	tarsal 53 mm.
<i>flavipes</i>			
× 4	108	268	212
<i>melanoleucus</i>	34	80	63
× 3	102	240	189

Skull comparison.

	head	bill	lumen	solid tip
<i>flavipes</i>	26 mm.	42 mm.	21 mm.	21 mm.
× 4	104	168	84	84
<i>melanoleucus</i>	32	61	22	39
× 3	96	183	66	117

An unrelated considerable difference in the skulls of the two, difficult for an untrained osteologist to describe, and which would be almost impossible to properly photograph or figure because of the concealed situation and diverse planes of the parts involved, occurs in the palate. The two longitudinal palatal troughs are deeper, higher sided in *melanoleucus*, and there is greater vertical expansion of these bones inward in that species at a point under the front of the orbit. Indeed, the palate of *flavipes* looks superficially more like that of *Micropalama* than of *melanoleucus*. These differences between the two palates are not altogether superficial; for instance, a small ossified ligament which in the Greater Yellow-legs runs downward and forward to join conspicuously with the main long stay running backward from the base of the bill along the lower side of the head, in the Lesser Yellow-legs passes inside this stay to join the bones of the palate.

The transverse processes of the ribs in the Greater Yellow-legs are broader and crookeder at the base with a distinct downward angle, differing from the condition in the Lesser much as from that in *Micropalama*. The two smaller birds are much alike here, perhaps a difference correlated with size; also perhaps with habit. The roof of the pelvis in *flavipes* curves out over the great foramen more than in *melanoleucus*. These seem to be minor differences.

Skeletal differences between these two species are sufficiently profound to eliminate the possibility of their being closely related as species go, despite their color resemblance. This fact has an interesting theoretical bearing. The Yellow-legs are a good example of the natural phenomenon which may be called the "two-sized form,"

the Downy and Hairy Woodpeckers present another such example. This phenomenon occurs sufficiently frequently not to be explainable by mere chance, and, at the same time, to be worth some attempt at explanation. What, then, might be a cause for such a close approximation of color in this case?

To quote from a paragraph published by the writer in 'Forest and Stream' for March, 1919:—

"Cases among birds, similar to that of the Yellow-legs, where two species are practically identical in color though differing markedly in size, are not rare. Very likely the Greater Yellow-legs is not so closely related to the Lesser as its similarity in plumage would lead one to suppose. Perhaps its similarity to that species not infrequently enables it to escape the Duck Hawk, deluded into believing it is dealing with the smaller, less active bird."

There are some facts which lend a reasonability for considering the Greater Yellow-legs a mimic. The first has to do with the economy of the chase as practised by animals of prey. It is believed that a hawk starting to hunt has a definite idea of what species it wishes to capture, just as a man has. Otherwise it would be apt to fail, as a sportsman who fires into a flock of birds on the chance that some of them will get in the way of his load, is apt to shoot through the holes in the flock. To be sure, there is not much definite data to substantiate the idea that hawks do hunt purposefully, but there is some to indicate that the Kingfisher fishes purposefully.

In 'Copeia,' 1915, pages 27 and 28, an account of an examination of the fish bones in a Kingfisher's nest indicates that its pair of birds confined their fishing to a very considerable extent to a single species of fish.

Another indication that the colors of the Greater Yellow-legs are purposely like those of the Lesser is found in the nature of this color resemblance. It does not extend perfectly to a correspondence of individual feathers and the markings of the Greater Yellow-legs are sharper and more contrasting, making its specific name, *melanoleucus*, appropriate. But how do these colors work in the field at a distance sufficiently great to reduce, to appearance, the size of the larger bird? They blend, giving the identical effect of the plumage of the Lesser Yellow-legs at lesser distance more

nearly than if the colors of the Greater Yellow-legs were in fact identical with those of that species. It is obviously not a corollary of larger size which makes the colors sharper, for we have the still larger Willet with a not dissimilar type of marking, but the marking much less sharp as well as greyer.

There is a practical disadvantage in emphasizing the structural differences between the two Yellow-legs as has been done in this paper, namely, its possible ill effect on contemporary nomenclature. There is no doubt that these differences are sufficient, quantitatively and qualitatively, to be of generic significance in many, if not most, groups of birds. However, such structural differences are obviously specific within the present genus, in spite of the fact that recent authors have considered them generic and have split that genus into many parts. It will be noted that Ridgway, although leaving our two Yellow-legs together, separates from them the Green-shank of Europe on one hand, and the Red-shank on the other hand. To apply the same criteria for species in one group as in another cannot be done. Through a long series of birds, color differences may be specific and all but slight structural differences generic. In fishes, on the other hand, it is only rarely that color is a specific criterion. In most species it is quite ephemeral, though in some cases well marked color types of adaptive significance extend across several genera. To make structure a generic criterion in fishes would do away with that convenient entity, the species; the majority of these each becoming a separate genus. It would also render fish classification entirely incomparable with that of other animals, for the species surely does exist in fishes as well as in birds or any other branch of the *systema natura*.

In conclusion, when the proportional skeletal differences between the two Yellow-legs, here indicated, have been grasped, the eye will differentiate them more readily in the field, just as an artist can portray any animal more convincingly if familiar with its skeletal structure.

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